IoT Application: Project Proposal Guidelines

Introduction

This document outlines the project proposal guidelines for the IoT Applications course for M1 students. Each group, equipped with an ESP32, Arduino Nano 33 IoT, a Raspberry Pi 4, and a sensor box, is tasked to develop an innovative IoT application.

Project Scope

Core Components:

- Microcontrollers: ESP32, Arduino Nano 33 IoT
- Server: Raspberry Pi 4 with IoTStack
- Sensors: Various (temperature, humidity, etc.)
    - Extra Credit: Considering additional sensors than the DHT11 (temperature, humidity) and accelerometer

Communication Protocols:

- At least three communication protocols should be used in the application.
- Mandatory: BLE (Bluetooth Low Energy), MQTT (Message Queuing Telemetry Transport)
- Optional: HTTP, TCP (At least one to be included)

Server and Microcontroller Interaction:

- Microcontrollers should communicate with the server.
- The server must send commands to the microcontrollers.
    - Ex: turning on LED, triggering some action, etc.

Software Stack:

- Arduino IDE for ESP32 and NANO 33 IOT.
- Node-RED: For at least two automation tasks.
- Database: InfluxDB (mandatory), SQL database (optional, if needed).
- Visualization: Grafana (mandatory), web visualization (optional, if needed).
- Web Server: NodeJS/Express (if needed).
- Android mobile app: Optional, if needed, for a BLE use case.

Extra Credit: Establishing BLE communication between ESP32 and Arduino.

Project Proposal Requirements

Project Idea: A brief description of the chosen application or use case.
Architecture: Detailed architectural diagram showing all components and their interactions.
Data Collection: Strategies for gathering data from sensors.
Communication: Explanation of how different communication protocols are implemented and integrated.
Data Processing and Storage: Methods for processing and storing data.
Visualization: Approach for data visualization using Grafana or similar tools.
Automation Tasks: Description of at least two automation tasks implemented in Node-RED.
Challenges and Solutions: Any anticipated challenges and proposed solutions.

Evaluation Criteria

- **Innovation:** Originality of the project idea and application.
- **Complexity:** Effective use of the provided hardware and software stack.
- **Integration:** Seamless integration of different components and protocols.
- **Teamwork**: Coordination and task distribution within each group.
- **Presentation:** Clarity and thoroughness in explaining the project architecture, data flow, and functionalities.